Navigation Economic Technologies NETS

17-March-2005

US Army Corps of Engineers

Institute For Water Resources - IWR

NETS Goals:

- The goal of NETS is to advance the Corps world-class engineering with state-of-the art tools and techniques for economic modeling and analysis.

NETS vs. Upper Miss

- NETS is a research program aimed at both Inland and Deep Draft navigation economic evaluation.
- Many NETS research efforts have focus on the Upper Mississippi river in the hope that some products would be useful to the Upper Miss study team.
- It is up to the Upper Miss study team to determine the usefulness or appropriateness of any NETS product to the Upper Miss study.

NETS Team

- Includes:
  - Academics from seven universities
  - Representatives from
    - ORNL
    - TVA
    - Corps Centers of Expertise for Inland and Deep Draft
    - IWR

Activities

1. Modeling
2. Data Gathering
3. Knowledge Base
4. Peer Review
5. Communications

Modeling

1. Global Forecasting Models
2. Regional Routing Models
3. Microscopic Systems Models

Forecasting

The forecasting of commodity movements into the future can be dominate factor in estimating benefits of navigation improvements. The NETS research team is developing state of the art techniques for commodity forecasting. These techniques combine spatial equilibrium modeling, risk and uncertainty and scenario analysis.

A significant test of any technique will be the ability to hind cast.

World Grain Model

- The purpose of this study is to illustrate the development of a spatial equilibrium model to forecast international commodity flows from a specific region.
- The methodology will be robust enough to provide credible projects in flows for 50 years.
- The uncertainties of key variables will be explicitly considered.
- Forecasting of policy variables will be evaluated using “scenario analysis.”
- The methodology will be illustrated by an application to the grain sector on the Mississippi river system.
- The conceptual model and data acquisition have been completed. Model estimation and has begun and draft for review is expected shortly.

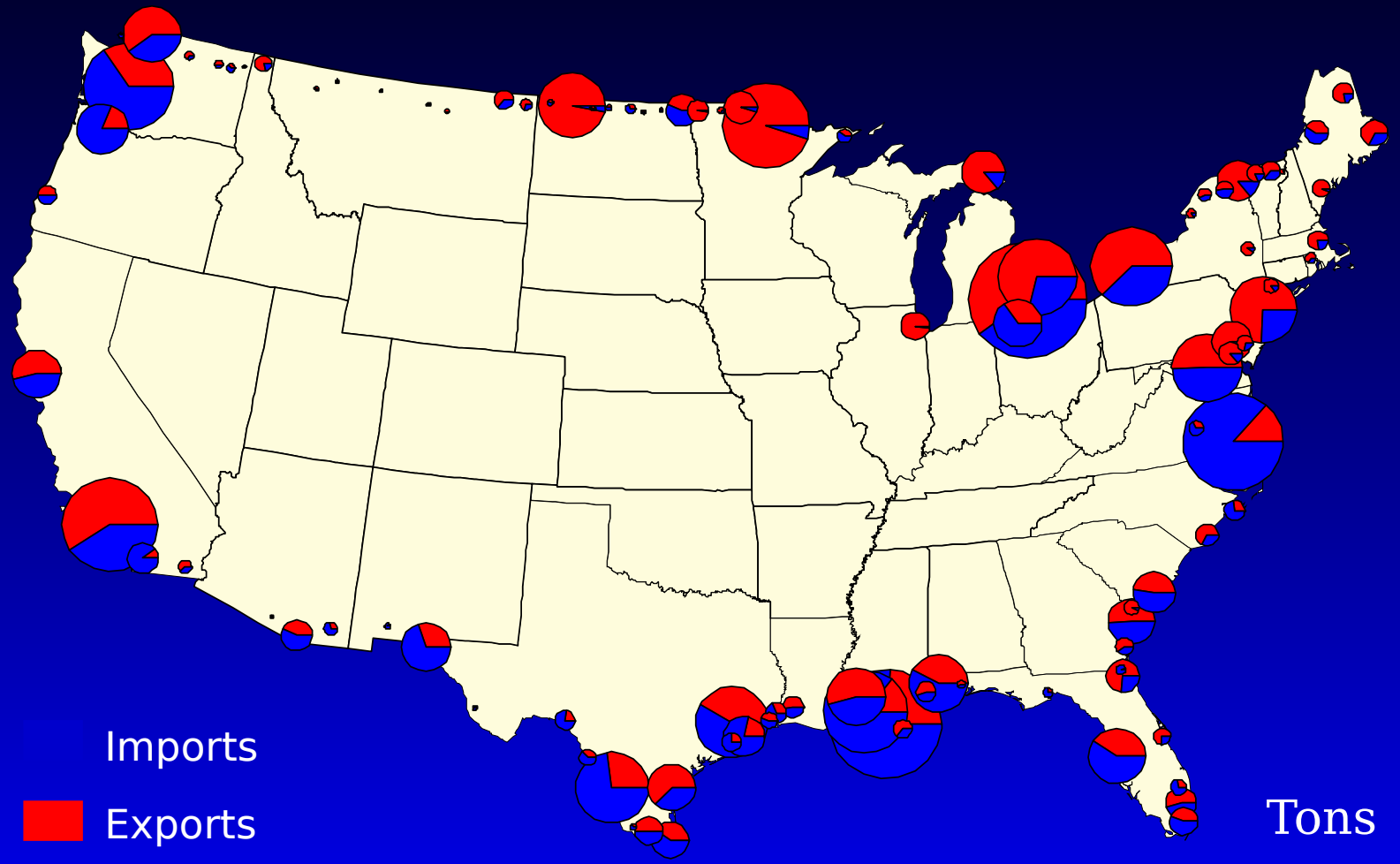
Other Commodity Groups

- Using grain as the “proof of concept” model. This technique will be applied to other commodity groups. Commodity groups to be examined next:
    1. Petroleum
    2. Containers
    3. Coal

Regional Routing Model

- The aggregate flows from the Global SEM forecasting model will assigned specific routes and modes.
- This will allow the project specific estimate of future traffic.
- Also, the affects to congestion and emission on the overland modes will be possible with this model.

Top Gateways for International Trade for Truck, Rail and Water



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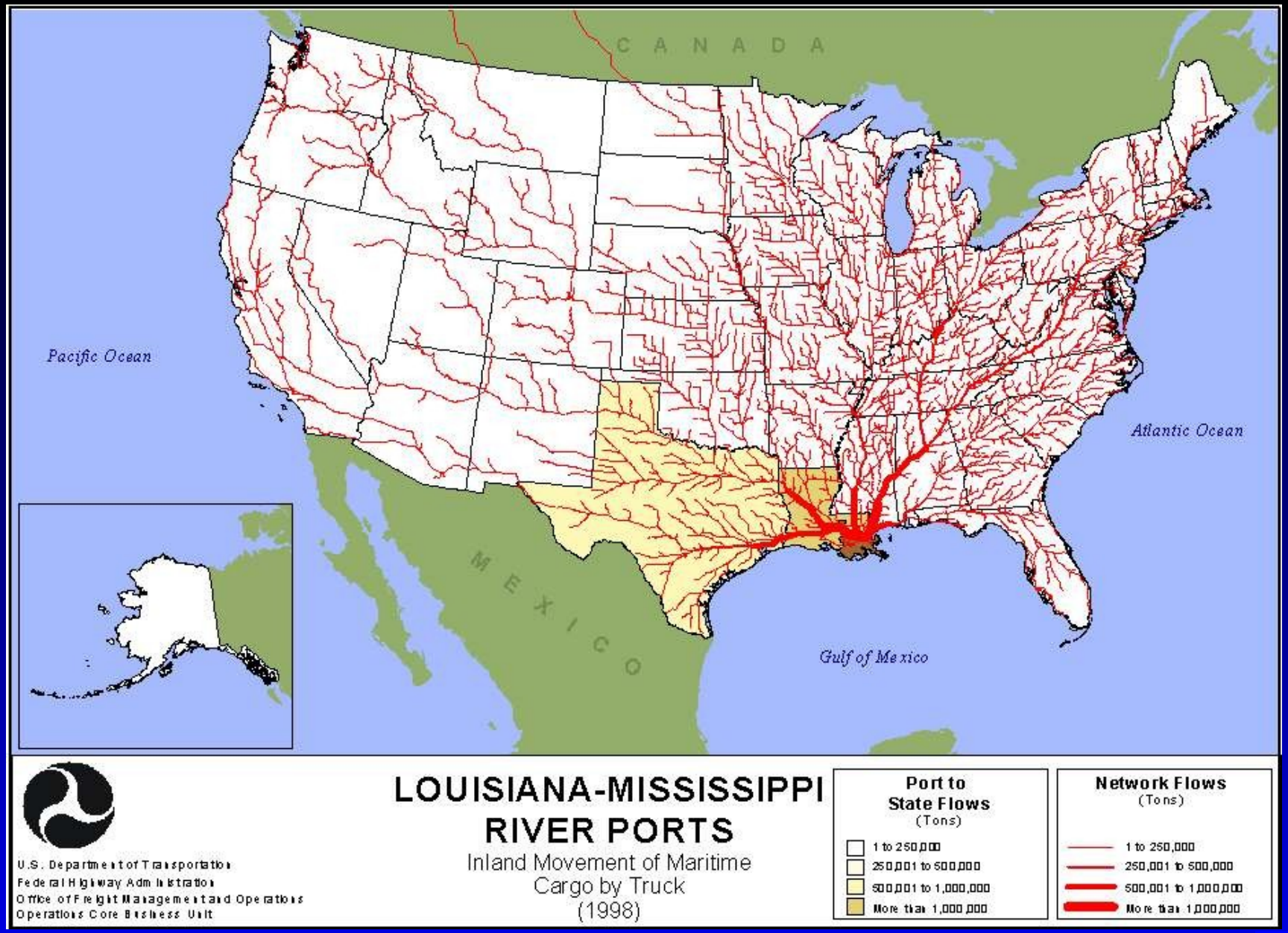

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Microscopic Systems Model

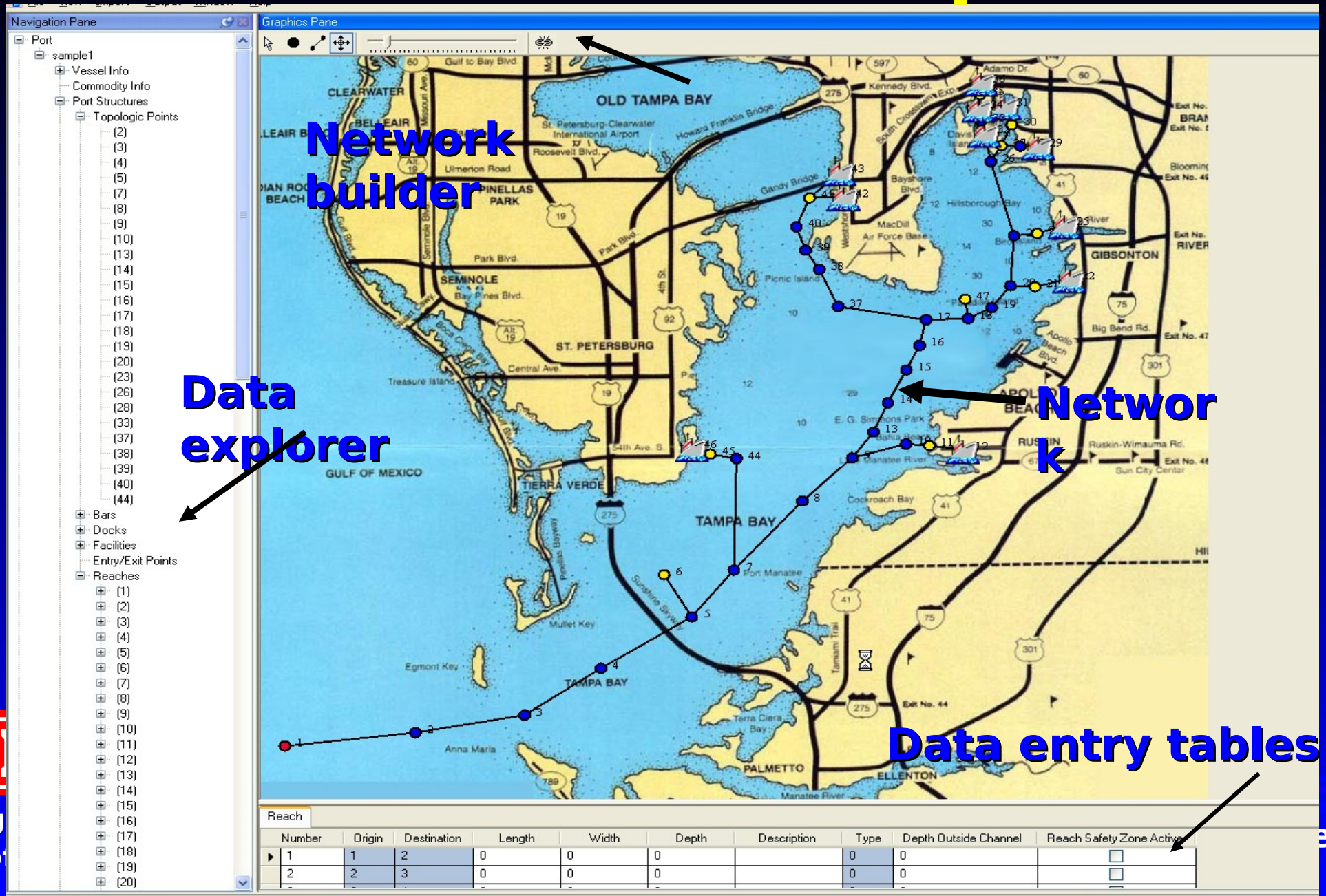
Evaluation of:

- **Tradable locking permits**
- **Scheduling – Appointment system**
- Congestion pricing
- Lockage efficiency measures
- Locking policies

Inland Waterways Model Development

1. CXIN Coordination and Tech Transfer
2. WAM BPP Improvements
3. WAM-NavSym Synthesis and Next Gen. Model
4. ORNIM modifications
5. Simulation/visualization
6. Planning Model – Generic ORNIM
7. Glass Box Model Development

Glass Box Example



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Revealed Choice and Stated Preference Choice Models

The NETS team is using stated preference and revealed choice techniques to shape the “shipper response function”. The idea is to attempt this on several waterways for several commodity groups.

Mid-America Grain Study

- Professor Kenneth Train of the University of California at Berkeley and Professor Wesley W. Wilson of the University of Oregon and the Institute for Water Resources form the study team.
- A survey of grain shippers was conducted to obtain information about the mode and origin/destination (O/D) of their shipments, the next-best alternative mode and O/D, as well as factors that might induce the shipper to switch to the next-best alternative.
- An econometric model was estimated on the combined revealed-preference data (the shippers' observed choices in the market) and stated-preference data (the choices that shippers said they would make if transportation costs or times rose for their current mode and O/D.)

Mid-America Grain Study

- This study has gone through an independent peer review process and the final report is complete. Also, a paper illustrating this study has been submitted to the Transportation Research Board (TRB) for publication and presentation at the January 2005 conference.

Mid-America Grain Study

This study demonstrated several things.

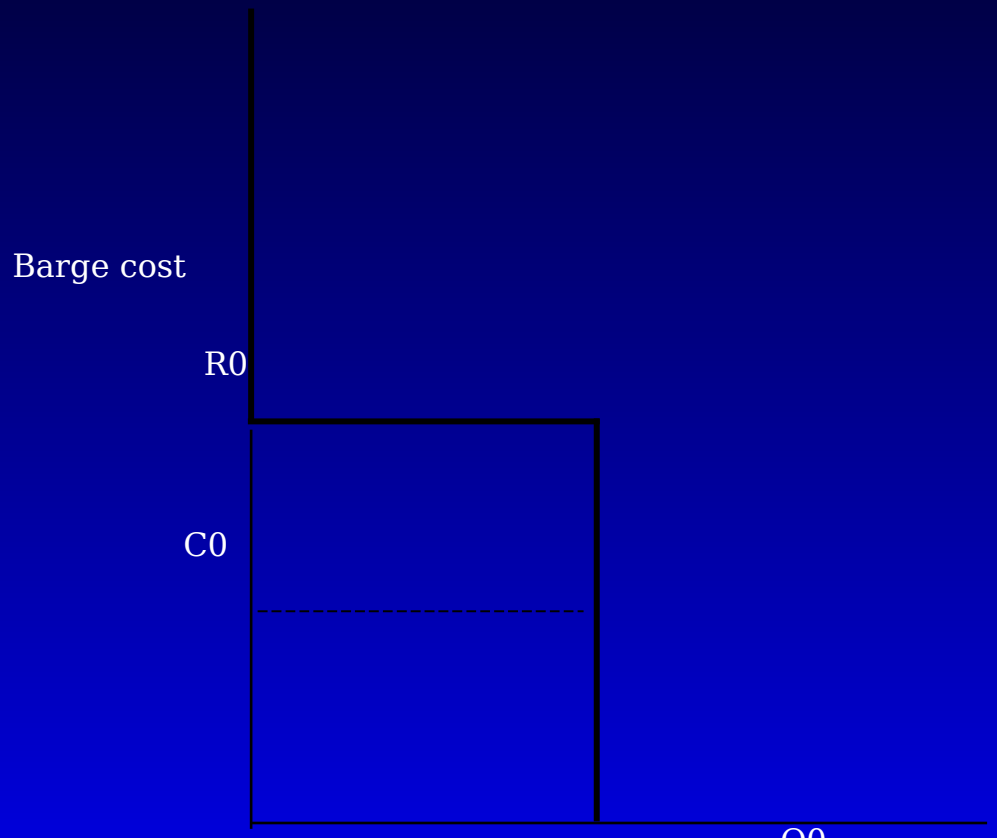
- The most important being that it is possible (though difficult) to collect the necessary information to estimate shipper response.
- Also, the study confirms the shortcoming of traditional methods. Specifically that the reservation price (alternative rail price) understates the willingness to pay and that perfectly inelastic demand overstates willingness to pay. The net result of these two offsetting affects is unknown.

Mid-America Grain Study

- The study developed a generic method for shaping the shipper response curve. An effort has been scoped to train Corps employees on apply this technique to specific origin-destination-commodity triplicates typical of Corps models.

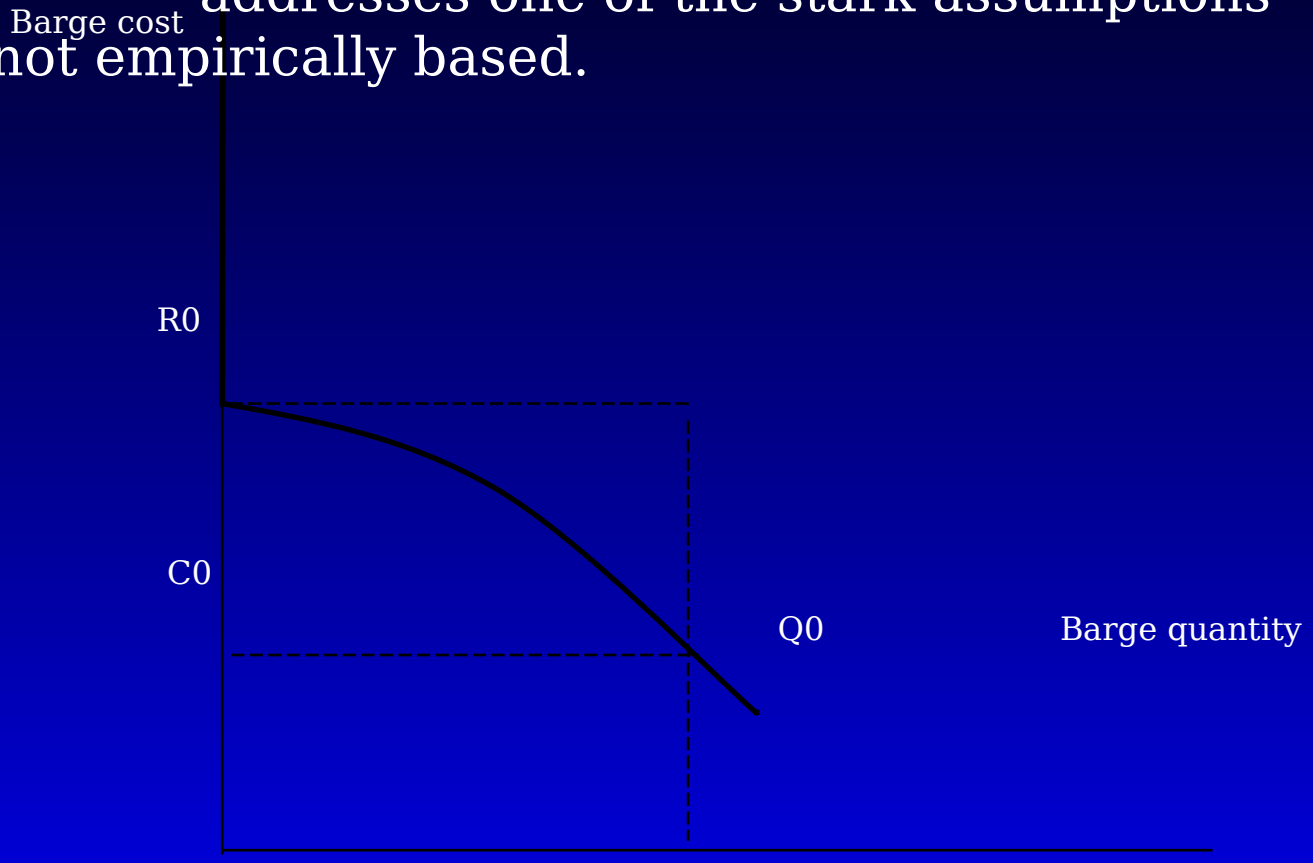
ODC Triplicate Demand Curve Shaped as Inelastic

-Two Stark assumptions

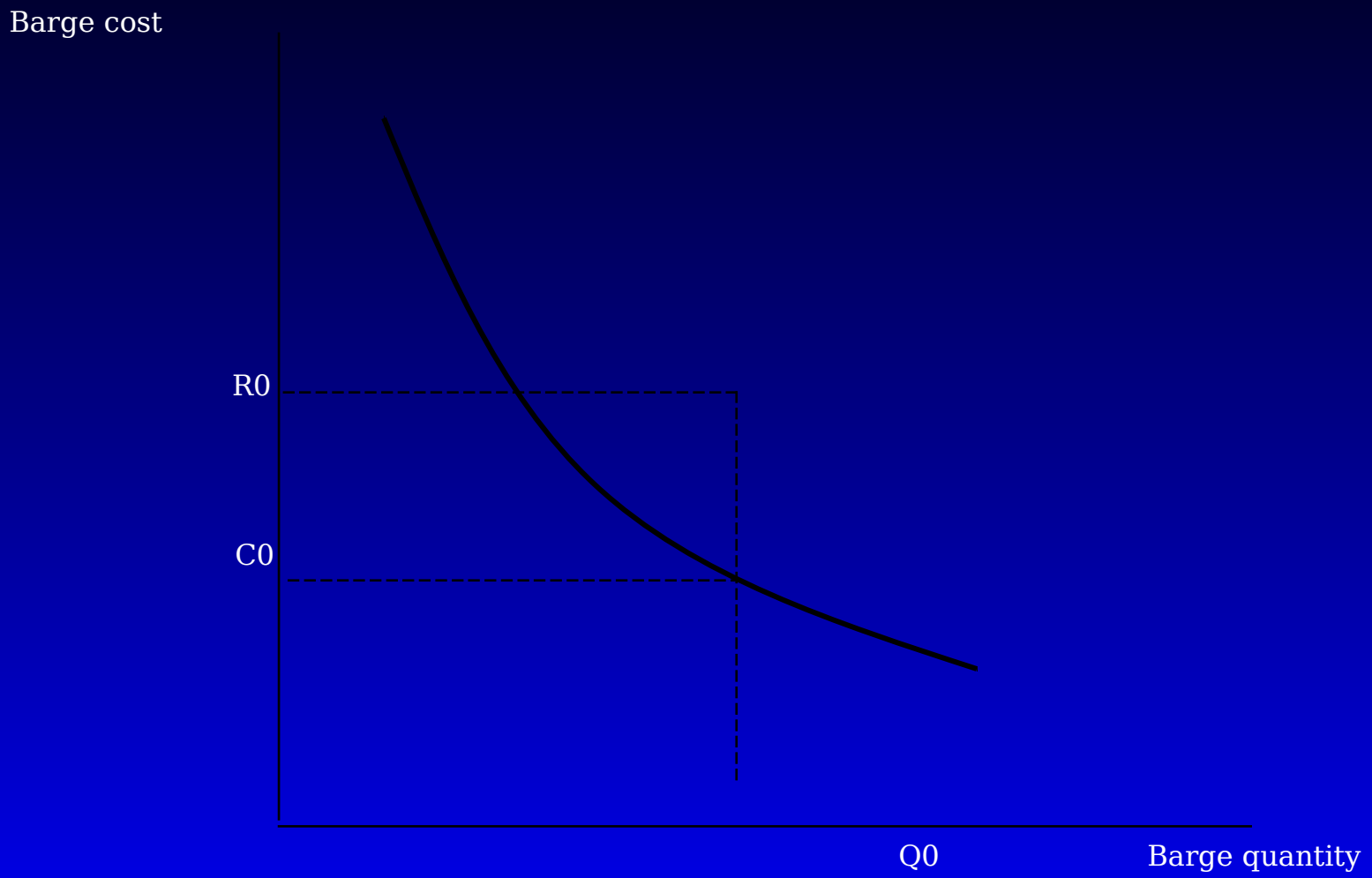


Demand curve shaped by Essence

-addresses one of the stark assumptions – but not empirically based.



Demand curve as shaped by Survey Model



Other Survey Work

- The study team is trying to repeat this effort on different rivers and commodity groups. The efforts are (or will be) focused on Ohio River coal and non-coal, the Columbia River grain and the Mid-America non-grain. Also, because of difficulties in sampling the study team is considering repeating the Mid-America Grain survey.
- TVA survey of waterside elevators.

EVENT STUDIES

- Forensic Economic analysis of an event.
- Coordinated and being executed by the LRD Cx for Inland Navigation.
    - Greenup closure
    - McAlpine L&D
    - L&D 27

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Spatial Equilibrium Theory & Models

Spatial Equilibrium Theory

- Assumptions about market structure
  - Infinite capacity on alternative mode
  - Market power in rail sector
  - Market power in barge sector
- Dr. Simon Anderson of UVA

Tradable Permits

1. Investigating the use of market mechanism to increase the efficiency of the waterway.
   - Dr. Joe Cook – NERA
   - Dr. Charles Plott – Cal Tech

Appointment System

1. NETS is teaming with UMSL-CTS to investigate the potential effectiveness

Industrial Organization Study

1. Designed to examine the degree of vertical and horizontal integration in the barge industry.
2. Attempts to develop cost functions for service delivery.

Reveal Choice Estimate

1. Dr. Ken Boyer and Dr. Wes Wilson augment LPMS data to estimate the demand for barges on the Mississippi river.

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Independent Peer Review

- An independent peer review process has been established and is being followed for critical research.
  - A list of experts is maintained by the contractor. This list is by area of expertise.
  - When a study is to be reviewed, IWR submits the product and identifies the areas of expertise needed to evaluate the effort.
  - The contract randomly selects from the list and contracts for review. The contractor manages the review.
  - Comments are then submitted anonymously from the contractor to IWR.
- The Mid-America Grain study was the first effort to go through this review process.

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Communications

- NETS web site launched in January 2005.
- NETS NEWS!
  - An email alert with summary information about new developments will go out to team members and other interested parties. The email will provide a link to the product on the NETS web site.

ISSUES
APPROACHES
ACTIVITIES
- Coastal Navigation
- Inland Navigation
- Multimodal Transportation

BOOKSHELF
TOOLBOX
NETS TEAM
NETS NEWS

US Army Corps of Engineers®

Developing State-of-the-Art Tools and Techniques for Economic Modeling & Analyses to Help Meet Tomorrow's Navigation Challenges

The U.S. Army Corps of Engineers is committed to spending the nation's tax dollars wisely by investing in navigation projects that provide the best value for the dollar long term. The Navigation Economic Technologies (NETS) program supports this mission by developing independently-verified economic models, tools and techniques.

Our web site is designed to provide the latest information on the NETS team, the issues we are addressing, the approaches we are using and the status of our activities. The NETS bookshelf contains final reports and policy guidelines, while the toolbox holds final instruments, models, etc. that result from our research. For regular updates on our progress, sign-up for ***NETS News***, a monthly e-newsletter delivered directly to your inbox.

Questions?